



Department of
**Environment &
Conservation**

Post Comment Presentation SOP Rule Chapter 0400-40-06

September 12, 2019

Division of Water Resources

Objective of Sessions

- Provide insight regarding purpose of proposal and a discussion of the resources utilized in support of the proposed standards
- Appeal to Stakeholders regarding alternate data sources or alternate approaches

Catalysts for Rule Proposal

- Need

- The Department considers these rules to be necessary.
 - Responsibility to Public per TN Water Quality Control Act
 - Limiting Component to System Longevity
 - Natural Condition
 - Limited in Capacity and Difficult to Reliably Quantify
 - Not much can be done to improve the response of a soil profile
 - No indication that the capacity of an area of soil improves with time
 - History of Compliance/Enforcement Issues

- Recurring Themes

- TDEC can't enforce Design Criteria
- Standards must be established by rulemaking to be enforced
- “The State approved it.”

Authority Supporting Rule Proposal

- TN Water Quality Control Act
 - State's Responsibility To Insure Unpolluted Waters
 - "...take all prudent steps to secure, protect, and preserve this right..."
 - Board's Responsibility
 - "...promulgate after due notice and enforce rules and regulations that the board deems necessary..."
 - Commissioner's Responsibility
 - "...administer and enforce...all standards, policies, rules, and regulations..."
 - "...Require the submission of such plans, specifications, technical reports, and other information as deemed necessary to carry out this part or to carry out the rules and regulations..."

General Concerns

- Minimum Design Standards Should Not Be In Rule
 - Board Approval to Proceed with Rulemaking – April 16, 2019
 - Support of TDEC Leadership
- Economic Impact
 - Consideration of this impact relative to the proposed rules will take place in multiple venues
 - Response to Comments will provide detail regarding the costs of the proposed standards
 - Cost of Installation
 - Cost of Land Area

Primary Topics Receiving Comments

- Reserve Area
- Utilization of Land Application Area
- Design Flow
- Soil Loading Rates
- Ponding
- Secondary Treatment Levels
- Slope

Reserve Area Requirements

Why does additional area seem like a good idea?

- We have already experienced numerous instances where it is desperately needed
- It can be established at the time of development thereby reducing the burden on the utility and ratepayers
- Waiting till it is needed is not the best time to account for it
- The soil profile is a natural condition and we are bound to its limitations
 - How long will it last with the loads we are sending?
 - What changes are we causing to the soil?

Reserve Area Requirements

- Backup Plans for Problematic Land Application Areas
 - Establish Reserve Area at Time of Development
 - Acquire additional land application area after failure
 - May not be available
 - Expensive
 - Reduce flow to meet land application area capacity after failure
 - Not likely once the homes/structures are established
 - Pipe the flow to another facility
 - Expensive
 - Access
 - May not be available
 - Pump and Haul
 - Expensive
 - Not Long Term

Reserve Area Requirements (cont.)

- Fifty % Reserve Area insures a readily available contingency plan with “known” attributes
- Many systems across the State could benefit from additional land application area. Some have been problematic for years and have no other good alternative.
- Multiple entities that approve or operate these systems within the State have established reserve area requirements

Land Application Area Utilization

- This topic is based on the question: “What is the effective area of a drip emitter?”
 - Science Based (soil and hydrology)
 - Engineering Based (flow rate, dosing volume, dosing frequency, ...)
- Daily Flow and Soil Loading Rate Determine Area Necessary
- Performance of the Land Application Area, both hydraulically and treatment, rely on the uniform distribution of the effluent throughout the area.
 - If the soil is not being influenced by an emitter, that part of the land application area can hardly be claimed as “utilized”
- Many sources of data regarding drip emitter effective area have been considered.

Land Application Area Utilization (cont.)

- Information has been reviewed from several resources:
 - Research
 - Agricultural
 - Wastewater
 - Modeling and Field Measured
 - Wastewater Industry
 - Other Regulatory Entities
 - Manufacturers

A compilation of reference material has been developed for several years and was the basis for the proposal (copies are available for review).

Since the proposed rules were placed on public notice additional, extensive review effort was made regarding this subject. These findings confirmed earlier review.

Land Application Area Utilization (cont.)

- Concept of wetted area of emitter is not new
 - Current design criteria recommends emitters and lines should be at 2-foot spacing
 - May allow line spacing of 5 feet and 10 feet depending on site conditions – provided that each emitter supplies a minimum wetted perimeter of not more than 10 square feet.
- Division has not identified any information suggesting a drip emitter is capable of engaging or wetting an area of 10 square feet
- Furthermore, the Division finds no information supporting an emitter actively utilizing an area that is longer than it is wide.

Land Application Area Utilization (cont.)

- Review of related information overwhelmingly indicates the effective radius of influence from a drip emitter to be from 0.5 feet to 1.5 feet.
- This range considers variable soil types, flow rates and dosing strategies.
- Accordingly, multiple governing agencies utilize a standard value of 4 square feet of area per emitter as a design standard – provided the emitters are spaced at least 2 feet apart.
- This rule proposes to adopt the same standard.

Land Application Area Utilization (cont.)

- The proposed rule does not mandate 2-foot line spacing.
- Every land application area is unique. Some lend themselves to 2-foot line spacing, some don't.
- The designer must consider site variability/limitations during the earliest consideration and subsequent design.
 - Resulting land application area must be reflective of area utilized.
- Flat or uniformly sloping sites without obstructions and installation limitations can be most efficiently utilized with drip dispersal technology
- Steep, irregularly sloping sites with obstructions and other installation limitations are less efficiently utilized.
 - May support less than the desired daily flow
 - May require more overall area to support the desired daily flow

Minimum Design Flow

- The proposed rule establishes a minimum daily design flow of 300 GPD per residential dwelling unit
 - Historical, 300 GPD is currently used in the Design Criteria
 - It is the primary safety factor in the Design Criteria
- Safety Factors
 - Redundancy
 - Design Flow
 - Primary safety factor for system design, treatment and application
 - Protects in high flow events, weather, operating conditions
 - Assumed to cover peak flows for low unit counts
 - 50% Reserve Area
 - Area for future repairs
 - Long term soil area performance
 - LTAR estimate
 - The two safety factors cover different risks
 - Combined, are they overly protective?

Minimum Design Flow

- We've had a number of comments regarding the use of 300 GPD/unit
 - Some comments have proposed a tiered approach
 - Research shows the variability of peaks versus average flows diminishes with increased number of units
 - Average flows are usually around 170 GPD...
 - Data from TN supports an **average** daily flow in the range of 150 to 200 GPD for subdivisions

Minimum Design Flow

- Where we are with single family residential units:
 - Considering a tiered approach to minimum design flows
 - Based on information submitted and additional research
 - 300 GPD for the first 15 units
 - 250 GPD for 16 to 30 units
 - 225 GPD for additional units
- Feedback
 - Review the referenced study...comments.

Using Risk Analysis to Predict Design Flow Exceedance of Decentralized Wastewater Management Systems (Dobbs, Cox, Tyner, Buchanan), Water Environ Res., 82, 2357 (2010)

Minimum Design Flow

- Per Capita Flow
 - Establishing minimum per capita flow is considered primarily due to the vacation properties
 - Current rule proposal establishes 65 GPD/person for other residential units including rental/resort properties.
- What we've looked at; EPA Onsite Manual, research papers and Other States
 - The EPA recommends a design flow for a cabin at 40 GPD/person... the same as a dormitory
 - A luxury camp with private bath is 90 GPD/person, Hotel at 50 GPD/person
 - Other states or counties can be 75 to 100 GPD/person
- How much wastewater is generated per person
 - Indoor water use ranges from 57 to 83 GPD/person (12 studies)
 - Wastewater generation of 51 to 71 GPD/person (4 studies)

Minimum Design Flow

- Per Capita Flow
 - 65 GPD/person appears to be a reasonable number.
 - 65 GPD/person is specific to residential units and vacation properties.
 - Other minimum design values default to the design criteria
- Other ways to do it
 - Square footage? Does square footage predict wastewater flow?
- Feedback:
 - Data
 - Is 65 GPD a good minimum or too low for luxury facilities?

Maximum Hydraulic Loading Rates

- Not Tyler's Chart
 - Compilation of multiple states, manufacturers and has been in TN rules since 2009 for individual homes
 - Not for design... maximum values
 - Nothing magic, middle of the road to conservative values from available sources for long term acceptance rates
- Purpose/Goal of LTAR's
 - Maintain aerobic conditions
 - Preserve the current infiltration rate and predictability of the soil
 - Some data indicates that the infiltration rates can significantly decline in as little as 30 to 120 days if the soil is overloaded.
 - Infiltration rates are degraded by suspended particles moved in the soil, clay, microbial cells, sugars, organic material when soils remain saturated.
 - Prolonged saturated conditions can cause physical clogging and biological clogging

Maximum Hydraulic Loading Rates

- Long Term Acceptance Rates Feedback
 - Data
 - Instantaneous loading rates
 - Clay mineralogy
- *Ying Jiang & Satoshi Matsumoto (1995) Change in microstructure of clogged soil in soil wastewater treatment under prolonged submergence, Soil Science and Plant Nutrition, 41:2, 207-213, DOI: 10.1080/00380768.1995.10419577*

Ponding

- The proposed rule defines Dry-Weather Persistent Ponding as ponding that:
 - Occurs at least 24 hours after a ½ inch or greater rain event
 - Results from land application
 - Last longer than the rest period between dosing cycles
- Purpose/Goal
 - Establish an accepted definition of ponding for designers, TDEC staff and Operators
- What the soil provides in aerobic conditions
 - Reduction of organic matter
 - Removal of large pathogens, bacteria, and viruses through filtration, adsorption, and die off
 - Controlled return of wastewater to the water cycle, predictability
 - Some nutrient reduction

Ponding

- Ponding on the surface as a result of system operation
 - Indicates saturation, loss of aerobic conditions
 - Drip lines at 6 to 10 inches deep, ponding in dry weather is a problem, no data supporting design of such systems
 - No long term data to support the reliability of soil properties under over-application
 - EPA *“Whenever water is ponded over the soil surface, the rate of application exceeds the soil infiltration or permeability”*
 - Can’t expect the soil to preserve infiltration rate or treatment long term
- Ponding Feedback?
 - References or suggestions regarding ponding definition.

Secondary Treatment Standards

- Currently under review
 - Main concerns is nutrient management
 - Difficult to quantify denitrification in soil (carbon, micro sites, etc...)
 - Most important reduction is uptake
- Feedback
 - Monitoring
 - Most reasonable measurement frequencies?

Conclusion

- We have the opportunity to ensure the long term success of our industry by:
 - Establishing minimum and maximum values that will protect water quality while at the same time protect the utilities, developers, county governments and customers
 - Some utilities do not have design standards, rely on TDEC approval
 - Supports developer confidence and investment protection
 - Most county governments rely on TDEC approval as a measure of reliability
 - Increase the chances of successful long term performance
 - Protect investment in critical infrastructure

Next Steps

- Alternate Data Sources or Alternate Strategies are Welcomed
- Please provide them to the following email address as soon as practical so they can be considered prior to the next scheduled session.

Britton.dotson@tn.gov